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Working the System: A Model for System-Wide Change in Pre-Service Teacher Education

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Working the System: A Model for System-Wide Change in Pre-Service Teacher Education

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Abstract: This paper reports on a study undertaken to identify the strategies and models used to facilitate curriculum change within teacher education institutions. Findings indicate three main approaches, which we name the 'resource development', 'action research' and 'contextual change' models. A new model that combines the best features of each is proposed. In this paper we provide a brief overview of the three models, a rationale for the new model being proposed, and a discussion of the systems theory concepts underpinning the model. It is our contention that the Mainstreaming Change model provides a structure for change to occur simultaneously at a number of levels within a teacher education system. We conclude by discussing some issues that may facilitate or limit the effectiveness of the model in practice.

Introduction

Teacher education is directly impacted by a plethora of contemporary social issues and agendas including increasing concern about sustainable development, rapidly emerging internet and communications technologies, and issues related to health and wellbeing. Many argue that responding to these agendas should be at the core of teacher education, not supplementary to it (Walsh, Laskey, McInnes, Farrell, Mathews & Briggs, 2011; Lingard, Mills & Hayes, 2000; Cochrane-Smith, 2010). However, educational organisations are notorious for their glacial pace of change in responding to such agendas to support social transformation (Priestley, Miller, Barrett & Wallace, 2011; Fullan, 2005; Cuban, 1998). This is in part because they tend to be large, complex and unwieldy organisations that are part of even larger and more complex systems. A lack of research-based models for the professional development of teachers in pre-service teacher education further compounds this issue (Luke & McArdle, 2009; Petrie & McGee, 2012). In addressing this gap, our research into mainstreaming sustainability education in pre-service teacher education has identified a variety of 'models of change' at work in this context. While our research initially focussed on models of change used to embed sustainability education within pre-service teacher education, we argue in this paper that these models have broader application than this issue.

This paper thus focuses on reporting on two aspects of a broader research project. This study was undertaken with funding from the Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA) through the Australian Research Institute in Education for Sustainability (ARIES). We first briefly describe the different 'models of change' ('models of change' refers to the different types of initiatives, strategies, techniques, processes, interventions and products that teacher education organisations and the individuals within them use to enact change) we identified from our review of 25 different sustainability education initiatives used within teacher education. A more comprehensive description and analysis of these models has been reported elsewhere (Ferreira, Ryan and

Tilbury, 2007). Secondly and more significantly, this paper builds upon this analysis to propose and theorise a potential new model of change, one that allows for the three key change-oriented goals of each of the 'models of change' to be achieved within a pre-service teacher education context.

Background to the Study: Sustainability Education as a Social Agenda

As awareness of declining biodiversity, increasing habitat loss and the threat of climate change grows (Intergovernmental Panel on Climate Change (IPCC), 2007), the role of schools and teachers in preparing students for the challenges of sustainability also increases. Indeed, the need to prepare teachers to teach for sustainability was identified over 20 years ago by the United Nations Educational, Scientific and Cultural Organisation-United Nations Environment Programme (UNESCO-UNEP) (1990, 1) as 'the priority of priorities' for the field of environmental and sustainability education. Since then, there have been multiple calls for teacher education to be 'reoriented towards sustainability' (see, for example, Beckford, 2008; Fien, 1993; Hopkins & McKeown, 2001; UNESCO, 1997, 2004, 2005, 2009). However, indications are that pre-service teacher education institutions and programs are struggling to effectively prepare teachers, with teachers generally still poorly skilled in the unique pedagogies and processes of sustainability education (Boon, 2010; Tilbury & Cooke, 2005; Littledyke, Taylor & Eames, 2009; Ballantyne & Packer, 2009). There is general agreement in the sustainability education field that teacher education could and should be far more effective in preparing teachers in this area.

Growing interest in and support for sustainability education in schools has highlighted the need for well-prepared teachers both in Australia and internationally. For example, there are a number of initiatives operating internationally such as Enviroschools in New Zealand, Green Schools in China, and Eco-Schools in 50 countries (Foundation for Environmental Education (FEE), 2010). The need for sustainability education in Australia is recognised in the Australian Sustainable Schools Initiative (AuSSI) (Australian Government, 2010), and government policies including *Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools* (Australian Government and Curriculum Corporation, 2005) and *Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability* (Australian Government, 2009). More than a third of schools in Australia to date (Australian Government, 2010) have engaged with AuSSI. Clearly, there is interest in Australian schools in addressing sustainability. The new Australian National Curriculum also recommends that sustainability be included as a cross-curriculum perspective in all learning areas (Australian Curriculum, Assessment and Reporting Authority (ACARA), 2010). Given the problems of change in large educational organisations, our study investigated how a large system such as teacher education can be reoriented to best prepare teachers to teach for a range of social issues, including sustainability.

Study Design and Methodological Considerations

In order to explore effective change processes in teacher education further, the following key questions guided our research:

- What initiatives, strategies, techniques, processes, interventions and products are currently being used to embed new ideas within teacher education institutions?
- What are the opportunities and constraints of each?
- What common features emerge?, and
- How can an effective model for change in teacher education be developed?

Method

The research identified and analysed a range of Australian and international pre-service teacher sustainability education initiatives, with a focus on their different approaches to change. The initiatives were identified by undertaking systematic literature and website searches using a variety of databases (utilising key words such as 'change strategy', 'models of professional development' etc. in Boolean search patterns). We also sent requests for initiative recommendations to the sustainability education community via e-lists, and also drew on our own previous experiences and knowledge of initiatives... Initiative documentation, including program structures, supporting materials, resources and evaluation reports were obtained from initiative websites where possible. Correspondence also took place with initiative leaders and related stakeholders to obtain additional information or seek clarification. This process resulted in the identification of 25 different initiatives. Document analysis was undertaken using the following coding scheme: longevity of program, funding and management structure, partnership approach, target audience, operational context, aims, objectives and focus of program, educational processes, program implementation strategy, change approach, extent and depth of participation in program, participant incentives, challenges, lessons learnt, evaluation strategy and findings, and areas of innovation. Where data about the change processes employed by each initiative were omitted from documentation, interviews were conducted with program leaders. Data were analysed and summarised in a data retrieval chart and then small vignettes written to capture the change process succinctly. The chart and accompanying vignettes were returned to initiative leaders for validation.

Findings: Models for Change

As a result of our analysis, three generic models for change being used in teacher education institutions were identified: (1) Resource development, (2) Action research, and (3) Contextual change. These are outlined briefly below (Fig. 1) and discussed in detail in Ferreira, et al. (2007).

Model	Approach to change	Level of engagement	Depth of engagement
Resource Development	Individual (curriculum and pedagogy)	Broad (wide audience)	Shallow (but can be increased with innovation)
Action Research	Practitioner and Institution (curriculum, pedagogy, policy, practice)	Narrow (smaller focussed audience)	Deep (sustained change)
Contextual Change	Systemic	Narrow but targeted with potential for disproportionate impact	Dependent on process

Figure 1: Approaches to change (Adapted from Ferreira, Ryan and Tilbury, 2006, 51)

Resource Development Model

The Resource Development model was the default model for change identified in this study. The model at its most basic involves the production and publication of a resource 'kit' that enhances and assists the teaching of a specific issue within teacher education. Generally, the resource is accompanied by professional development workshops to encourage teacher educators and others to bring about change. In its simplest form, the Resource Development model assumes that change can occur through the provision of curriculum and pedagogical resources and adequate training in their use. Interestingly, in the sustainability education field, innovative adaptations of the model have incorporated a phase of collaborative resource development, which engages teacher educators in the development process. This engagement, it is assumed, increases their uptake and commitment to the initiative.

The Resource Development model has a number of advantages. For example, it has the ability to reach a large target audience and is relatively cost-effective because in most instances, once the resource is produced and disseminated there is little on-going cost. However, the model has a number of drawbacks. For example, its success depends very much upon the take-up and use of the resource, relying on the interest of individuals (Hardy, 2008). The assumption underpinning this model is that change in teacher education is most effectively achieved by targeting individual practice, usually in relation to curriculum, pedagogy and/or assessment.

Action Research Model

Action research is a well-established research method, however, the term has become so ubiquitous - being used to describe almost any strategy of planned action, reflection and improvement, even those that could better be described as reflective practice, action inquiry or researched action - it is almost in danger of losing meaning as a research method (Tripp 2005). It is important, therefore, to clearly define what we mean when using the term 'action-research' in this context. Strictly speaking, the term action research should be limited to inquiries that employ "recognised research techniques to inform the action taken to improve practice" (Tripp, 2005:446). However, while we recognise the importance of the research orientation in this definition, we adopt a slightly broader definition that emphasises the reflective practice dimension, viewing action research as a process in which practitioners "gather evidence about their practices and critique assumptions, beliefs and values embedded in them" (Elliott, 2000:209).

In the initiatives we analysed, action research was both evident as and/or explicitly named as a process aiming for sustained change through providing participants with an

opportunity to drive the process of change (Wadsworth, 1998; Kemmis & McTaggart, 2000; Ginns, Heirdsfield, Atweh & Watters, 2010; Mills, 2010). Initiatives that used action-research, while not as common as the Resource Development model, aimed to do more than introduce new curriculum and/or pedagogies. They aimed to enhance capacity (Hardy, 2008) so that teacher educators became competent developers of curriculum, as opposed to deliverers of an externally developed resource.

In this model, therefore, action research refers to a form of reflective professional development. The model appears to be most effective when it engages individuals who are able to act as change agents (change agents are those individuals responsible for or seeking to implement change within an organization. See also our discussion on the role of individuals as hubs of change) – in both the policy and practice arenas – within their institutions (Fien, Kumar & Ravindranath, 2001).

Advantages of the Action Research model include engaging a range of participants from within an institution, developing resources and strategies that are of direct relevance to participants, engaging participants in a process of reflection on their practice, and building a sense of collaborative enquiry (Hardy, 2008). Disadvantages are that it is time-intensive and usually only a small group of individuals is able to be involved at any one time. Proponents of the Action Research model argue that change is best achieved and sustained through building the capacity of individuals so that they are able to fully engage in a process of change (Alvarez & Gutiérrez, 2001; Tilbury, Coleman & Garlick 2005; Reason & Bradbury, 2008). Underlying such arguments is an assumption that a bottom-up approach to change is the best. We argue, however, that solely focussing on participant-driven strategies for change is limited because such approaches often fail to take into account the impediments to change that may exist within the broader institutional context and environment.

Contextual Change Model

The Contextual Change model is underpinned by a complex understanding of the teacher education institution as existing within, and affected by, a larger system. In addition, there is a recognition that the whole teacher education system both influences and is influenced by individual teacher education institutions, or sub-systems. Initiatives using a contextual approach to change therefore seek to ensure that multiple sub-systems within a system are aligned in their efforts to bring about change. While it was easy to identify a wide range of initiatives based on the Resource Development and Action Research models, only two initiatives were identified that were underpinned by a contextual approach to change. This may be indicative of the difficulties of working with complex systems or a tendency to focus on the local and known when individuals and organisations are working towards change. However, the model is advantageous in that it allows for change to occur across a complex system simultaneously. We suspect that if change occurs in this way there is a greater chance that the change will be sustained.

Discussion: A New Model of Change

Each of the models described above seeks to bring about change in teacher education institutions by acting at different leverage points across and within the teacher education system – whether at the point of curriculum, pedagogy, practitioners and institutions, or across a whole system. In our review, the most effective model appeared to be the Contextual Change model as initiatives using this model explicitly considered how a large system such as a teacher education institution could be reoriented towards sustainability. As the key concern of this study is with implementing change across teacher education systems, these initial findings, along with those provided by change theories such as systems theory, were then used to develop a new model for change. We have named this the Mainstreaming Change model. In order to understand this complex model, however, an understanding of systems theory is required. A summary of key concepts is therefore presented below, framed within the context of teacher education.

A Systems Theory Framework for Change

What is a System?

A system is made up of discrete elements that are interrelated. Systems are bounded, that is, there are features that are within a system and features that are outside of a system in the contextual environment surrounding the system. Fig. 2 illustrates how sub-systems are nested inside a larger system that is in turn situated in a broad contextual environment. Each system has a permeable boundary through which information and resources can pass. Boundaries set the types of exchanges that occur between the system and its sub-systems and their contextual environment.

Systems may be hard, that is, definite physical entities with a specific purpose that can be formally described, such as mechanical or electronic systems. Conversely, soft systems are constructed entities that represent attempts to map and model human activity. Soft systems can be hierarchical, that is, contain sub-systems within the system, as illustrated in Fig. 2. In addition, the boundaries of soft systems are not pre-ordained but are rather defined by those within the system (Checkland & Poulter, 2006).

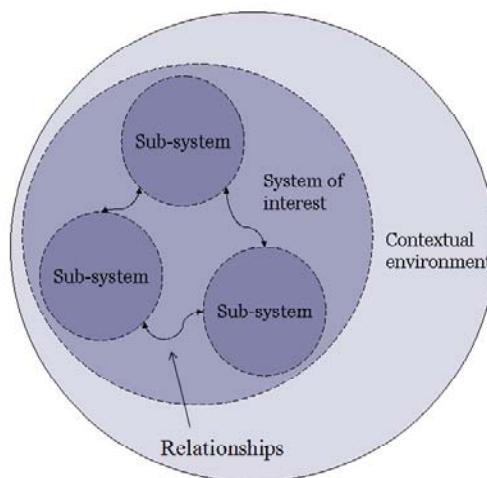


Figure 2: System components (Adapted from Ferreira, Ryan, Davis, Cavanagh and Thomas, 2009)

A teacher education system can be understood as a soft system. Such systems have numerous sub-systems, interconnections among their sub-systems, rules, stakeholders with

differing agendas, and institutionalised hierarchies. The way a system is defined, that is, where the boundaries are placed around a system, influences what can be changed. For example, a system could be a single teacher education institution, or an entire state teacher education department, or all institutions and individuals who are involved in some way with teacher education, depending on how the boundaries of the system are defined. The sub-systems within a pre-service teacher education system could include, for example, individual teacher education institutions, teacher registration bodies, professional associations, student bodies, schools, and government departments of education. Each of these sub-systems is itself a system that contains additional sub-systems such as curriculum committees, course coordinators, faculty departments, policy sections, councils and/or unions, and so on.

Identification of the System

Identifying the system of interest and its sub-systems forms the first important step in efforts to think and work systemically. The system – the area of interest for researchers – is identified through the delineation of a boundary around the system. This differentiates the system from its environment. In systems theory, the environment is something that cannot be directly influenced by the system, but has an influence upon the system. The system's boundary and its relationship with its environment should be explored; this includes interactions and exchanges with the environment (inputs and outputs), and direct and indirect influences between the system and its environment.

The setting of a boundary for the system is a powerful way of concentrating change efforts as it helps to delineate the focus for change agents (Packham & Sriskandarajah, 2005). It represents what the change agents believe they can control or influence and therefore indicates feasible areas of action. Poor and/or overly ambitious boundary setting at the outset of a project, and a lack of on-going reflection on a system's boundaries, roles, and who can influence what, all impact on the success of projects focussed on enacting change within and across systems.

In setting and interpreting a system's boundary, the change agents are able to negotiate and decide what they have the ability to control or affect. Boundaries can change, for example, when a field of influence expands or contracts, or the purpose of a system changes. A bounded system is thus a temporary created construct. Indeed, as Flood (1999, 97) notes, it is most useful to understand the system as a 'bounded action area ... a partial and temporary view ... that is considered most helpful for now,' rather than as fixed and immobile. In this way, understandings of what constitutes the system can be continually reconstructed and reinterpreted, using iterative and adaptive learning processes.

A system can be mapped or delineated by creating a diagram of it. The usefulness of creating a diagram of the system in question lies in the process of developing it, rather than in the completed diagram itself. Systems maps are notoriously complicated, messy and unwieldy earning them the well-deserved nickname of 'horrendograms'. The system mapping process involves a dialogue between change agents and stakeholders within the system about:

- relationships between and across system components,
- who or what can be influenced within a system and by what means, and
- how proposed efforts may help to realise change, such as the mainstreaming of sustainability education within a pre-service teacher education system.

Making such boundary judgements – what constitutes the system, the sub-systems, and the environment – improves the change agent's understandings of the system. It helps to clarify each change agent's role and the role of others, as well as identifying feasible interventions or leverage points within a system at a particular point in time. Fig. 3 below

illustrates some of the relationships and interactions between common elements of a teacher education system as an example of the components of a systems map.

When mapping a system, it is also important to consider the potential for individuals within the system to enable change within their own settings or parts of the system. All agents within a system face constraints that affect their abilities to enact change. For example, an individual's ability to act is constrained by forces such as regulations, policies, politics and resources. An individual's ability to act is also affected by their willingness to champion an issue, by time and resources, and power relations. It is the processes of interpretation, co-construction and development of shared understandings of a system, its elements, interactions, and its drivers that inform those seeking to bring about change within and across a system.

When seeking to improve a situation of concern in a complex environment, it is useful to bring together key stakeholders within a system to share their understandings of the parts of the system and their role in relation to every other part and the larger system as a whole. For example, a stakeholder group could explore their perceptions of the influence that teacher registration boards and government education departments have on each other, on a teacher education institution, on the stakeholders' own roles, and vice versa. Thus, rather than trying to change the activities occurring only in individual teacher education institutions, a systemic approach to change works to influence and change the various sub-systems that comprise the whole system. In this way change can be more easily achieved, if for example, the capacity of individuals at the teacher education institution sub-system level can be built, while simultaneously enacting supportive policies in a government education department sub-system.

Holistic Focus

As we have noted, a systems approach to change seeks to explore and better understand a whole system rather than to act on a part of a system in isolation from other parts and the broader context. To do this, participants from throughout the system need to collectively explore interdependencies, the nature of connections between system parts, external influences, and their own and others' roles in the system. Participants come to understand the larger system through appreciating the patterns of activity and the many influences that exist within the system. A holistic systems focus thus goes beyond incorporating information from multiple perspectives and disciplines. Rather, it involves a deliberate method of synthesising distinct understandings about the system into a coherent whole (Gharajedaghi, 2006).

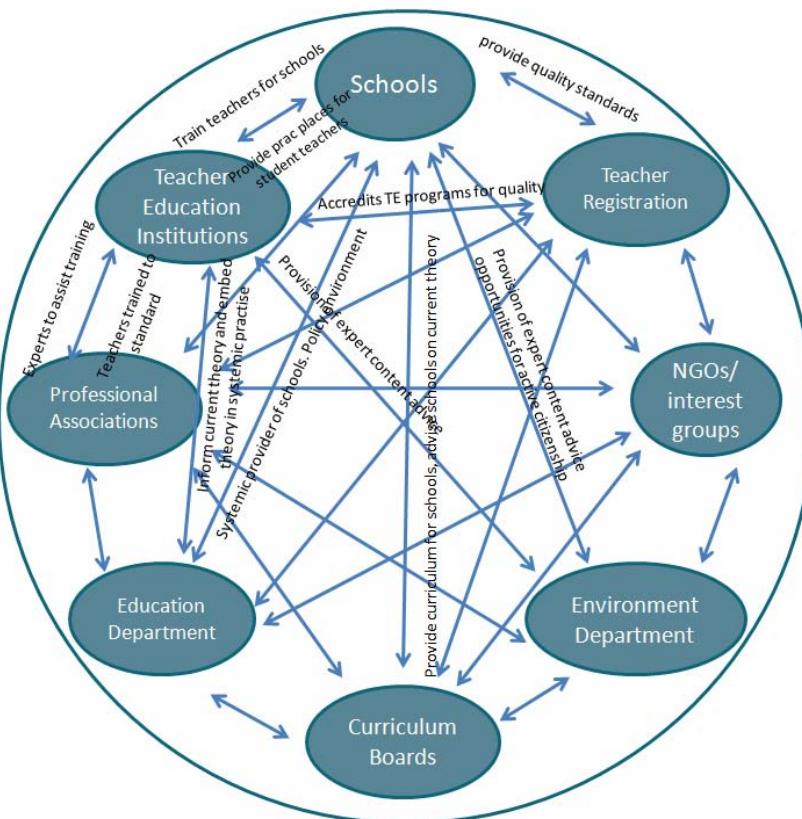


Figure 3: Sample Teacher Education System Map (Adapted from Ferreira, et al., 2009, 30)

A holistic view of a system is important because the behaviour of a whole system emerges from the interactions among its parts. Trying to 'solve' a problem by reducing it to its parts and acting on them separately can produce unpredictable outcomes and even make a situation worse, as such a reductionist approach fails to take the relationships between components into consideration (Flood, 2003, 2010; Jackson, 2003). The focus of a systemic approach to change is, therefore, on the several layers of sub-systems, the nature of their connections, and the relationships among the elements at each level of the system that the participants are working to change. This focus allows a more holistic understanding of the system of concern to be developed by participants.

Interactions Among System Elements

Central to thinking and working systemically is a clear understanding of the interactions or relationships between and amongst system elements. According to systems theory, interactions in a system are subject to 'hierarchical levels', 'hubs' and 'feedback loops'.

Hierarchical Levels

Once a system has been defined, three ‘levels’ of systems have been created: the environment, the system and any number of sub-systems. The system of interest is embedded within a contextual environment, and also contains within it sub-systems, as illustrated in Fig. 2. A ‘sub-system’ can change into a ‘system’ depending on what level is being focussed on at the time.

In systems theory, systems have properties of hierarchy and subsidiary (Ossimitz, 1997). This means that a sub-system cannot control a larger system of which it is a part. In turn, the larger system has varying degrees of partial influence or incomplete control over a sub-system. For example, if a single teacher education institution is seen as a sub-system, then it is influenced by, but has no direct influence over, the state teacher education system of which it is a part. While such a sub-system has no direct influence, changes within the sub-system can affect the larger system of which it is a part. For example, mainstreaming sustainability education in one teacher education institution could affect the way in which a government education department or curriculum developers think about sustainability education in teacher education more generally, and the way in which teacher educators in other teacher education institutions, or teachers in schools, engage with sustainability education. These are examples of indirect influence within a system.

It is important to identify these levels in systems to avoid attribution errors about cause and effect that oversimplify the issue of concern. For example, an incorrect assumption about what can be influenced and who needs to change can result in unsuccessful programs, and perplexed and frustrated participants. It is, therefore, crucial that participants take the time to define together the system of concern, negotiate its boundary, identify the nature of exchanges of information and resources that pass through the boundary, and make sense of areas of influence. This improves the understanding of actions that are likely to result in change, where the points of leverage (or hubs – see below) lie, and who is most likely to be successful in enabling change within a system.

Hubs

Another concept central to systems thinking and efforts to achieve systemic change is the notion of hubs (Barabasi, 2003). In a complex system, hubs are the nodes or connectors that link with a disproportionate number of other nodes – often hundreds of times more than other nodes. Hubs form a fundamental part of networks, being 'present in very diverse complex systems, ranging from the economy to the cell' (Barabasi, 2003, 56). Identifying and working with the hubs in a system is important when seeking to leverage change within that system (Meadows, 2008). The idea of a hub is allied to the concept of a leverage point in systems dynamics – a place in a complex system where a small change in one area can bring a disproportionate change to a whole system (Hjorth & Bagheri, 2006; Flood, 1999; Meadows, 1997).

The concept of hubs has been popularised through ideas such as 'six degrees of separation' and documentaries such as *The future makers: How Kevin Bacon cured cancer* (Essential Media Entertainment and NSW Film and Television Office, 2008). Given the pivotal role hubs play in a system, it is important that hubs are correctly identified and involved in bringing about change within and across a whole system. This can be achieved through a systems mapping exercise that identifies roles, needs and interactions between parts of the systems of interest in order to locate hubs and areas of activity within a system.

Feedback Loops

Other types of system interaction are feedback loops, both negative and positive. Negative feedback loops are a way for systems to regulate or stabilise themselves. These feedback loops keep the system in stasis by continuous adjustment. A simple example of negative feedback in action is the temperature regulation of the human body where the body releases sweat to cool it down. This type of behaviour in a system is considered a balancing loop (Hjorth & Bagheri, 2006; Senge, 2006). Positive feedback, in comparison, is a mechanism that enhances the degree of perturbation within the system, such as exponential population growth. In a teacher education system, for example, a negative feedback loop could be the bureaucratic processes and procedures associated with large educational institutions that often frustrate the efforts of people attempting to effect change. A positive feedback loop could be the ways in which change agents encourage others to change, who in turn encourage further change, amplifying the original effect.

Systemic thinking also helps us to recognise that there can be 'delays' within a system, so the outcome of an action may not be apparent for some time, just as there is a delay between eating and feeling full (Senge, 2006). For example, trainee teachers can take up to four years to begin teaching in schools, so there will be a delay before they put into practice in schools what they have learnt during their teacher education programs.

Mainstreaming Change Model

These key concepts from systems thinking, along with our examination of models used to effect change in teacher education institutions, have provided the theoretical framework for the Mainstreaming Change model (Fig. 4) we propose here. This model seeks to marry broad engagement across the system (Contextual Change model) with the active participation of stakeholders within the system (Action Research model). As the Action Research model allows for a variety of participants to deeply engage with the process of change, and the Contextual Change model supports wide engagement across a whole system, we propose that merging these two models may provide an avenue for sustaining change throughout a teacher education system.

The Mainstreaming Change model thus provides a framework for achieving systemic change. In addition, the model provides some guidance on the processes to be followed. These include:

- Identifying the system and its components;
- Delineating the system's boundaries in order to understand what can and cannot be influenced and changed;
- Mapping and understanding the nature of the relationships between the system components;
- Identifying and involving hubs or change agents within and across the system who are able to provide points of leverage;
- Building a common vision for the change that is to be achieved, in ways that develop ownership of that change;
- Using action research processes to build participants' capacity for change and to monitor and adapt the processes of change;
- Developing communication strategies to ensure a co-ordinated and strategic approach aligned to the vision for change is undertaken across all parts of the system; and
- Continuously evaluating and monitoring the processes of change at the sub-system and system levels.

The Mainstreaming Change model thus provides a structure through which change is able to occur simultaneously at a number of levels within a system. Within a teacher education system, this might occur at the accreditation, policy, planning and practice levels. The model is based on the assumption that long-term sustained change is most likely to occur when a common vision for change is widely shared throughout a system, and when all members of that system are collectively supported to operate in ways that are consistent with the common vision. It is our contention that such an approach could mainstream a change across multiple levels of a system and work to create commitment to and ownership of change across a whole system.

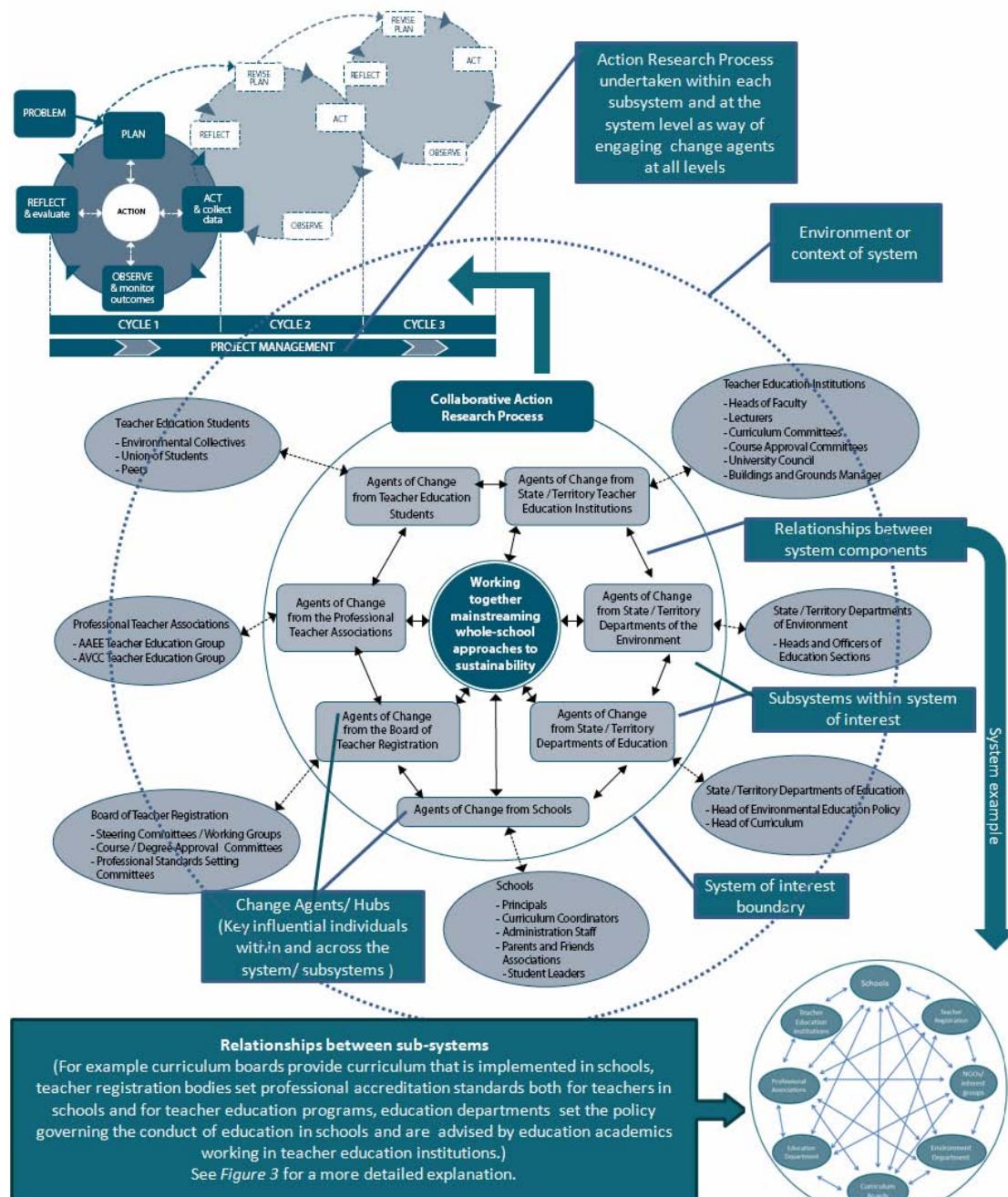


Figure 4: Mainstreaming Change Model (Adapted from Ferreira, et al., 2009)

Conclusion

As noted earlier, a key issue within the sustainability education field is the lack of appropriately educated and skilled teachers. Our research identified three models of change currently utilised within teacher education in varying degrees to embed new perspectives and this paper builds on this analysis to propose and theorise a new approach to mainstreaming change within teacher education. Although our research was particularly aimed at investigating ways to effect change for sustainability education within pre-service teacher education, the applications of our research are relevant to any general change efforts within teacher education systems.

The model theorised in this paper is systemic and thus seeks to engage simultaneously all stakeholders and change agents within a teacher education system in mainstreaming a change. This would include not only teacher educators – often the main target of change initiatives – but also, for example, staff of teacher registration bodies, education department officers, supervising work placement teachers, professional association representatives, and curriculum developers, all of whom are often neglected in pre-service teacher education change initiatives. Such a systemic approach to change will, we argue, lead to proactive rather than reactive strategies for change as all stakeholders are able to be jointly engaged in the process of change.

In this paper we present a strategic model for mainstreaming change within pre-service teacher education that draws on systems theory. Although the model we propose is theoretical, in practice there are a range of issues that may facilitate or limit the effectiveness of the model in assisting change across the whole system. These include issues within the contextual environment, the subsystems and the relationships between the components of the system (including the role and capacity of the individual stakeholder). As the context within which teacher education exists is both spatially and temporally dynamic - teacher education itself being dependent on broader international trends and agendas - it is somewhat difficult to accurately predict the issues that will impact on the effectiveness of the model. Nonetheless, we outline below some current trends and issues that may facilitate or limit the effectiveness of the model.

Contextual Environment

- The current 'neo-liberal agenda', which prioritises evaluation, measurement, high-stakes testing, performativity and teacher standards, may limit the model through emphasising only certain aspects of the change process.
- Educational policies and curriculums can either facilitate or limit change depending on whether a particular agenda is represented in the policy. For example Sustainability Education is facilitated through the existence of the national sustainability education policy *Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools* (Australian Government and Curriculum Corporation, 2005) and as a cross-curriculum priority in the Australian National Curriculum.

Relationships

- Negotiating a shared understanding of the relevance and significance of the change amongst all participants in the system may be difficult to achieve and therefore act as a limit on the effectiveness of the model. However, if achieved, a shared understanding could facilitate the effectiveness of the model in achieving change.

- A competitive student recruitment environment means many pre-service teacher education institutions may be unwilling to collaborate in the area of teaching and learning. This would affect collaborative working relationships, which are fundamental to the effectiveness of the model.

Sub-system components

- University structures, strategic priorities, policies, programs and competing curriculum agendas can all support or constrain the effectiveness of the model at achieving change.
- Supportive leaders can enable a cultural shift that is consistent with the direction of change.
- Individual stakeholders' habitual practices, sense of their own agency and change acceptance also affect the model's effectiveness.

As has been discussed in this paper, there are a number of contextual layers that influence what is learnt and how it is learnt within a teacher education system, and the Mainstreaming Change model attempts to address the complexity reflected in these layers as well as to provide opportunities to capitalise on systems' synergies and dynamics. We have argued, therefore, that efforts at mainstreaming any social agendas in pre-service teacher education must involve all the key players from the different components of a teacher education system. It is only through such system-wide engagement that a change will be able to be mainstreamed within teacher education institutions.

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